

EDIBLE FISHES OF QUEENSLAND.

PART I.—FAMILY PEMPHERIDÆ.

BY J. DOUGLAS OGILBY (ICHTHYOLOGIST).

Les Pemphérides Cuvier & Valenciennes, Hist. Nat. Poiss., vii, 1831, p. 296.*Kurtina* part., Günther, Brit. Mus. Catal. Fish., ii, 1860, p. 508.*Kurtidæ* part., Günther, Zool. Rec., vii, 1870, p. 91 (name only)*; Day, Fish. India, pt. 2, 1876, p. 174.*Pempheridoidei* Bleeker, Atlas Ichth., ix, 1877, p. 5.*Pempheridæ* Jordan & Evermann, Fish. North & Mid. Amer., pt. 1, 1896, p. 977.

THE BULLSEYES.

Body strongly compressed, covered with moderate or small scales. Lateral line extending on the caudal fin to the tips of the middle rays, the tubes simple and straight, not extending to the border of the scale. Head almost wholly scaly, with short snout and narrow preorbital, the mucous system well developed. Mouth terminal and little protractile, with wide, very oblique cleft, the premaxillaries forming the entire dentigerous border of the upper jaw; no supramaxillary. Dentition weak; small teeth always present on the jaws, vomer, and palatines. Nostrils double, superolateral, contiguous, open, nearer to eye than to tip of snout. Eyes lateral. Bones of head feebly armed. Dorsal fin single, short, falciform, the spines slender and graduated, adnate to one another and to the first and longest ray; no procumbent spine in front of the dorsal. Caudal more or less emarginate, with pointed lobes and scaly base. Anal much longer than the dorsal, the spines short, stout, and separate. Pectorals asymmetrical, inserted below the middle of the body. Ventrals thoracic, approximate, pointed, with 15 rays, inserted below the pectorals. Gill-openings wide, gill-membranes separate, free from the isthmus; pseudo-branchiæ present; gills four, a slit behind the fourth; gill-rakers spinulose; pharyngeal bones separate. Stomach cæcal; intestinal canal convoluted. Premaxillary processes short; supraoccipital crest high and delicate; coracoids much dilated; scapula with a small foramen. Vertebrae 24 (10 + 14); the caudal rather elongate; ribs normal, narrow and compressed; the anterior sessile, the last five inserted on well developed parapophyses. (*πεμφηρίς*; a small fish, now unidentifiable, quoted by Athenæus from Numenius.)

* Not having access to the work in which Steindachner published his description of *Parapriacanthus* I am unable to say whether he was the first author to associate *Kurtus* and *Pempheris* under the family name *Kurtidæ*, but such is possibly the case.

Distribution :—

Small aberrant percomorphous fishes from the tropical and temperate zones of the Indian, Pacific, and West Atlantic Oceans, but not so far reported from the Mediterranean or West African Seas. While mostly inhabitants of the inshore waters, some species descend to a moderate depth, the greatest yet recorded being between 40 and 52 fathoms, at which depth specimens of *Liopempheris multiradiata* were trawled by the Endeavour off Bellinger Head, New South Wales.* This should, therefore, be taken as the limit of the ascertained bathymetrical range of the *Pempheridæ* up to the present time.†

The Indo-Pacific branch of the family appears to have originated in the Austro-Malayan subregion, whence it has spread northward to China, Japan, and the Caroline Islands; westward through the seas of India to the Red Sea, the East Coast of Africa (Zanzibar), and Mauritius; eastward through the Pacific Islands (Tahiti, Kingsmill, Samoa) to the West Coast of Mexico (Acapulco); and southward to south-eastern, southern, and south-western Australia, Tasmania, and even New Zealand. Between this southern colony and the Moluccas there is, however, a nominal break of some 3,000 miles, including necessarily the entire coast-line of Queensland, from which, up to the present, no pempherin has been recorded. That this break, which is partly bridged over by the occurrence of an outlying species at Lord Howe Island, is rightly called "nominal" is certain, since two of the Moluccan species—*Pempheris ovalensis* and *P. vanicolensis*—extend their range to the South Sea Islands, and are, therefore, probably found along the seaboard of intertropical Australia. The third Moluccan species—*P. macrolepidota* (Schneider)—also belongs to the typical genus. But, as might be conjectured, the further we get away from the metropolis of the group, the more liable we are to find characters, inconsistent with its original purity, developing in the species. It is not, therefore, astonishing that, of the four species, which inhabit the south-eastern corner of Australia, one only—*P. compressa* (Shaw) ‡—retains the typical characters; two others—*P. multiradiata* Klunzinger and *P. affinis* McCulloch—have developed in themselves distinct characters, on which I propose to establish the genus *Liopempheris*; the fourth—*P. elongatus* McCulloch—belongs to Steindachner's genus *Parapriacanthus*.

* In another haul the Endeavour secured specimens of the same fish on the ocean slope between Port Stephens and Newcastle at a depth of from 22 to 60 fathoms, but obviously it would be unwise to insist on the higher figure, since the inference is, that a fish, which occurs at a depth of one or two fathoms in Port Jackson, would more probably be taken near the inshore end of the drift in the same district.

† In this connection it is worthy of note that the family is not mentioned in Goode & Bean's standard work "Oceanic Ichthyology," nor does it occur in the Challenger, Hirondelle, Blake, Albatross, and Investigator Reports. It is only on coastwise trawlers, such as the Endeavour and Thetis, that this family appears.

‡ Even this species Snyder has associated with the Japanese *P. umbra* in a genus *Catalufa*, which, however, I am unable to recognise as distinct.

The distribution of this genus is most remarkable, as it may be said to have developed ontogenetically along the outposts of the group; first noticed from Japanese seas in 1870, it reappeared during the following year in the Red Sea under the new generic name *Pempherichthys*; next, after an interval of eighteen years, a third species was described from Lord Howe Island; and finally, after a further interval of thirteen years, South-Eastern Australia has yielded us yet a fourth species.

The Atlantic group has followed a somewhat similar but much more restricted line of development. Only three, possibly two, species are recognised, namely—*P. schomburgki* Müller & Troschel, *P. mulleri* Poey, and *P. poeyi* Bean; all are natives of Cuba, which should, therefore, be accepted as the centre of Atlantic development, from which *P. schomburgki* has sent out a branch to Barbados, and *P. mulleri* (which is possibly inseparable from the preceding species) another as far as the Coast of Brazil. A reference to the key given below will show that the third Atlantic species, *P. poeyi*, is excluded from the genera therein recognised by reason of its shortened anal fin, and is apparently developing along the same line as *Parapriacanthus*; unfortunately neither Bean nor Jordan & Evermann make any specific mention of the lepidosis of the anal fin, the inference being that it is scaly. If by chance Fowler's *Priacanthopsis*, which I have been unable to refer to, be founded on this species, I should be inclined to raise it to full generic rank.

The family, as here constituted, consists of four (or five) genera and twenty-one (or twenty-two) species.

Key to the Subfamilies and Genera.

- PEMPHERINÆ**:—Lateral line tubes short and wide; eye large, without adipose lid; preorbital entire; maxillary greatly dilated distally; pterygoids and tongue smooth; dorsal premedian; anal long, originating below or behind dorsal; branchiostegals seven; gill-rakers numerous and long; air-bladder large, constricted anteriorly; pyloric caeca well developed; vertebrae increasing in length posteriorly.
- a*¹. Body ovate; preopercle with one to three strong spines at the angle; teeth in the jaws pluriserial; anal scaly, with more than 30 soft rays.
- b*¹. Body scales cycloid and caducous; dorsal rays v 10 to 13 .. 1. *Liopempheris*.
- b*². All the scales ctenoid and persistent; dorsal rays (v or vi 9 or 10.. 2. *Pempheris*.
- a*². Body subovate; preopercle entire; teeth in the jaws uniserial; anal naked, with less than 30 rays 3. *Parapriacanthus*.
- LEPTOBRAMINÆ**:—Lateral line tubes long and narrow; eye small, with well developed adipose lid; preorbital serrulate; maxillary spatulate, feebly dilating from the front; pterygoids and tongue toothed; dorsal postmedian; anal falciform, originating well in advance of the dorsal; branchiostegals six; gill-rakers few and short; no air-bladder nor pyloric caeca; vertebrae of similar length throughout.
- c*¹. Body elliptical; scales small and ciliated; lower limb of preopercle serrulate 4. *Leptobrama*.*

LEPTOBRAMA Steindachner.†

Leptobrama Steindachner, Sitz. Akad. Wien, lxxviii, i, 1878, p. 388 (*mülleri*).

Neopempheris Macleay, Proc. Linn. Soc. N. S. Wales, v, 1880, p. 517 (*ramsayi* = *mülleri*).

Body elliptical. Scales small, persistent, ciliated, very finely and concentrically striated, with a broad roughened inframarginal band, arranged in regular series, those of the head, nape, and breast much smaller than the body-scales. Lateral line with a distinct curve anteriorly. Head small and conical, the snout obtusely pointed, naked; cleft of mouth curved; maxillary slender. Jaws with several series of small reflexed cardiform teeth, which increase in size from without, the inner mandibular series largest; a diamond-shaped patch of small sharp teeth on the head of the vomer; palatines with a band of similar teeth; ectopterygoids, entopterygoids, and tongue, each with a large ovate patch of still smaller villiform teeth. Eyes anterior. Lower limb of preopercle serrulate, the angle, produced in a broad membranaceous flap, but without armature; no opercular spine. Dorsal fin with iv 16 to 18 rays, anal with iii 26 to 30; caudal deeply emarginate; pectoral short and obtusely pointed, with 17 rays, the second simple, strongly compressed, and laterally expanded; ventrals rather small. Branchiostegals six, three on each epihyal and ceratohyal‡; gill-rakers rather stout; pharyngeal bones armed with strong recurved teeth, except the outer upper pharyngeal, which is mostly naked, while the teeth of the middle bone are exceptionally strong. (*λεπτός*, slender; *Brama*.)

* The presence of a persistent pneumatic duct to the air-bladder and the position of the ventral fins fully justifies the exclusion of *Bathylupea* from the *Pempheridae*, as insisted on by American ichthyologists. The same characters also exclude it from the *Berycomorphi*. With regard to the subjugular and degenerate ventrals of *Bathylupea* it is worth noting that, although the anal is similarly advanced in *Leptobrama*, the ventrals retain their normal position below the pectorals, as well as their normal development; this should be a strong point in favor of the separation of the two families. Since writing the above Regan (Ann. & Mag. Nat. Hist. (8) xii, 1913, p. 117) has followed Gill (in Goode & Bean, Ocean. Ichth., 1895, p. 190) in recognizing the *Bathylupeidae* as a distinct family, but dissociates them wholly from the *Berycoidei*, placing them among the *Percoidea* near *Lactarius*.

† It is due to the researches of Mr. McCulloch that I am privileged to record for the first time the identity of *Neopempheris* with *Leptobrama*. Under date 10-v-13 he writes—" *Neopempheris ramsayi* = *Leptobrama mülleri* Steind., who figures it beautifully in Denk. Ak. Wiss. Wien, xli, 1879, pl. iii, fig. 1. His figure might be made from Ramsay's specimen, it agrees so well." Also—" I have a large specimen nearly 200 millim. from Fremantle." I herein, therefore, tender my thanks to Mr. McCulloch for so courteously placing before me these new facts in time for inclusion in my paper, since his own " Note on *Leptobrama* . . . will not be published until after your Memoirs."

‡ In *Pempheris compressa* there are two on the epihyal and five on the ceratohyal.

Small fishes from the seas of Australia and Southern New Guinea, occurring sporadically. Nothing is known as to the habits, breeding, food, and bathymetric distribution of this remarkable fish, which, so far as our present knowledge goes, appears to visit our shores only at long and irregular intervals. From its form, dentition, the normal size of the eyes, etc., coupled with the fact that, though captured near the shore, none of the specimens which have fallen into expert hands exhibit any signs of breeding, one might incline to the opinion that these fishes are pelagic, habitually inhabiting the open sea near the surface. The capture, however, by the Bevan expedition of a specimen well up the waterway of the Aird River, British New Guinea, apparently demolishes the pelagic theory, while supporting that of the surface-swimming, since the example in question jumped into the boat of its own accord.

Two species have been described as belonging to the genus *Leptobrama*, but a more extended acquaintance with these fishes shows that the differences are either individual or sexual, probably the latter.

LEPTOBRAMA MÜLLERI Steindachner.

Leptobrama mülleri Steindachner, Sitzb. Akad. Wien, lxxviii, i, 1878, p. 388: Coast of Queensland—id., Denks. Akad. Wien, xli, i, 1879, pl. iii, figs. 1 to 1c—Klunzinger, Sitzb. Akad. Wien, lxxx, i, 1879, p. 381.

Neopempheris Ramsayi Macleay, Proc. Linn. Soc. N. S. Wales, v, 1881, p. 517, pl. xiv: Rockingham Bay, Q.

Neopempheris pectoralis Ramsay & Ogilby, Proc. Linn. Soc. N. S. Wales, xii, 1887, p. 563: Aird River, B.N.G.

(Plates XVIII, XIX.)

Depth of body 2.85 to 3.3, length of head 4.33 to 4.5, of caudal fin 3.8 to 4.15, of pectoral 4.95 to 5.45, of ventral 8.15 to 8.6 in length of body. Length of snout 4.5 to 5.15, diameter of eye 3.7 to 4.25, width of interorbit 3.75 to 4.55, length of maxillary 1.5 to 1.7, longest dorsal ray 1.2 to 1.33, longest anal 1.25 to 1.35 in length of head.

Ventral contour of body somewhat less to somewhat more arched than the dorsal, which is gently rounded or linear and feebly acclivous between the forehead and the dorsal fin; width of body 2.95 to 3.6 in its depth, which is greatest immediately in front of the anal fin and .33 to .5 more than the length of the head: caudal peduncle .3 to .45 longer than deep, its least depth 3.1 to 3.25 in the depth of the body. Width of head 1.85 to 2.05, depth of head 1.15 to 1.25 in its length. Snout with rounded profile, its length 1.1 to 1.4 in the eye-diameter, the two combined 1.15 to 1.45 in the postorbital portion of the head; interorbital region strongly convex, its width from one tenth more to one fifth less than the eye-diameter; adipose lid extending well on the snout and the postorbital region, but not quite reaching the

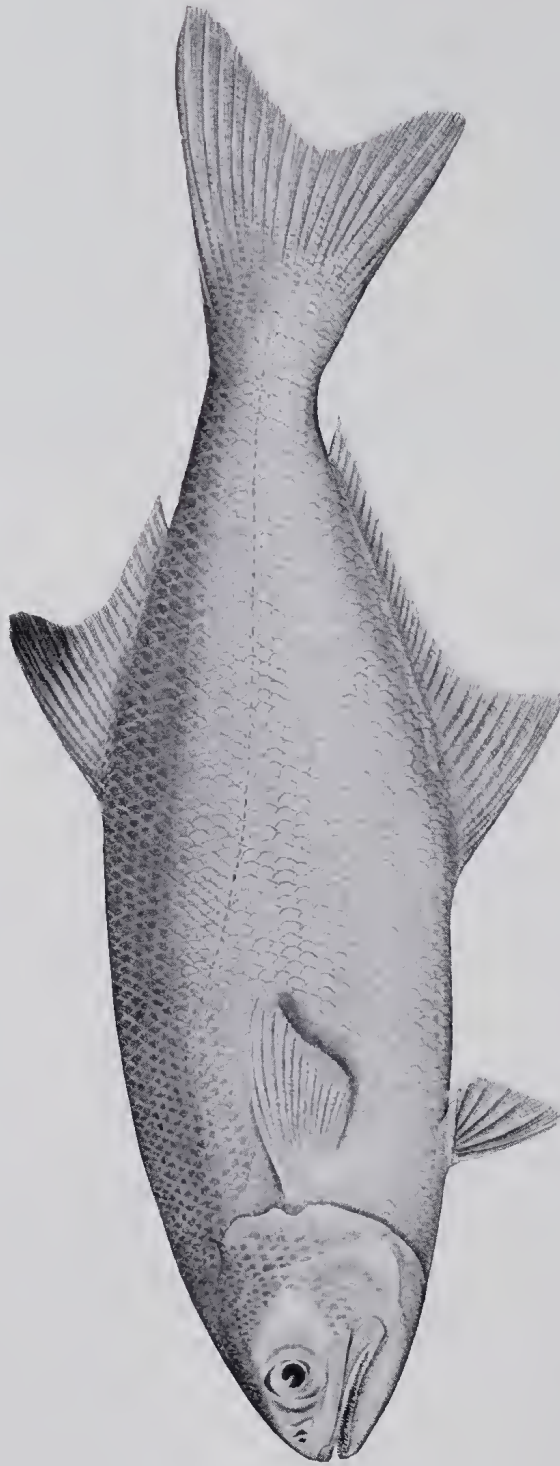


LEPTOBRAMA MÜLLERI Steindachner; ♀. $\frac{1}{3}$ Nat. Size.

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LEPTOBRAMA MÜLLERI Steindachner; ♂. $\frac{2}{3}$ Nat. Size.

pupil before or behind ; anterior nostril ovate, posterior arcuate and much wider. Jaws equal ; maxillary extending far beyond the eye, the width of its rounded distal extremity 7.4 to 7.75 in its length.

Scales 10 to 12/75 to 77/12 or 13. Axillary scales of pectoral and ventral subequal, as long as or longer than the snout. Lateral line varying from a rather long and shallow curve, which extends far beyond the tip of the pectoral, to a much shorter and deeper one, which just reaches that point.

D. iv 16 to 18 ; A. iii 26 to 30. Origin of dorsal fin .15 to .25 nearer to the root of the caudal than to the tip of the snout ; spines rather strong and pungent, the last 1.3 to 1.4 in the first ray. Middle caudal rays 1.55 to 1.75 in the upper and slightly longer lobe. Anal fin as high as or slightly lower than and from .5 to .66 longer than the dorsal, originating in advance of the middle of the body. Pectoral with 17 rays, as long as or longer than the head without the snout, the fourth ray longest. Ventral spine long, but weak and flexible, the outer ray longest, 1.85 to 2 in the length of the head and 1.9 to 2.15 in its distance from the anal, which is 1.05 to 1.25 in that from the tip of the mandible.

Gill-rakers 3 or 4 + 6 or 7, with one or two rudiments on each branch, the longest 1.9 to 2.3 in the eye-diameter and 1.33 to 1.6 in the longest fringes.

Silvery, with the back steel-blue, the line of demarcation well defined. Fins dusky, the produced portion of the dorsal lobe with or without a black or dark chestnut brown blotch. (Named after Baron Ferdinand von Müller, a celebrated Australian botanist.)

Variation :—So far as our limited series of specimens goes the two forms of this fish, which may be distinguished by the spotted or uniform dorsal fin, vary constantly in the following characters, which will, I believe, eventually prove to be sexual. In the spotted form, which I take to be the male, the body is noticeably more slender, the pectoral shorter, the forehead wider, the lateral line longer and less arched, etc.

Total length :—300 millim.

Range :—Coasts of Australia and Southern New Guinea, occurring sporadically. The localities from which specimens have been recorded are—Coast of Queensland (Steindachner) ; Rockingham Bay, Q. (Macleay) ; Moreton and Keppel Bays, Q. ; Fremantle, W.A. (McCulloch) ; and Aird River, B.N.G., 30 miles above its mouth (Ramsay and Ogilby, *vide* Bevan).

Described from four specimens (Keppel Bay, one male, 270 millim., presented by Mr. W. N. Jaggard, and Moreton Bay, three females, 206 to 266 millim., of which no data are obtainable) in the collection of the Queensland Museum. I had previously examined Macleay's type, and of course that of *Neopempheris pectoralis*.

NOTE.—In a letter just received by Dr. Hamlyn-Harris Prof. T. D. A. Cockerell, of the University of Colorado, suggests the advisability of separating *Leptobrama* as a subfamily from the other *Pempheridæ*. This conclusion was arrived at from an examination of the scales of *Liopempheris multiradiatus* and *Leptobrama mülleri*. This unexpected confirmation of my previous action is highly gratifying. (See Cockerell, p 55.)

LIST OF THE AUSTRALASIAN PEMPHERIDÆ.*

i. LIOPEMPHERIS Ogilby, ut supra, p. 62 (*multiradiata*).

1. MULTIRADIATA Klunzinger, Sitz. Akad. Wien, lxxx, i, 1879 (1880), p. 381: King George's Sound = *macrolepis* Macleay 1881 = *lineatus* Ogilby 1886. Fig.—Waite, Thetis, pl. x. South-Eastern Australia from Bellingen Heads, N. S. Wales, to off Kingston, S.A.†

2. AFFINIS McCulloch, Zool. Res. Endeavour, pt. 1, 1911, p. 45, pl. vii, fig. 1: Port Jackson to Newcastle.

ii. PEMPHERIS Cuvier & Valenciennes, Hist. Nat. Poiss., vii, 1831, p. 296 (*oualensis*) = *Priacanthopsis* Fowler, 1906 (?) = *Catalufa* Snyder 1911.

3. COMPRESSA Shaw, in White, Voy. N. S. Wales, 1790, p. 267, pl.— fig. Port Jackson. Metropolitan District of New South Wales.†

4. KLUNZINGERI McCulloch, *ibid.*, p. 47: King George's Sound = *mülleri* Klunzinger (not Poey 1860).

5. *macrolepidota* Schneider, in Bloch, Syst. Ichth., 1801, p. 164. (?) = *mangula* Cuvier & Valenciennes 1831 = *moluca* idd. = *malabarica* idd. Fig.—Bleeker, Atlas Ichth., pl. cccclxxxiii, fig. 2. Moluccas to India, China, and Japan; Red Sea and Zanzibar.‡

6. *oualensis* Cuvier & Valenciennes, *ibid.*, p. 299: Ualan = *otaitensis* idd. = *adusta* Bleeker = *mangula* Günther 1874 (not Cuvier & Valenciennes). Fig.—Bleeker, *ibid.*, figs. 1, 4, & 5; Günther, Godeffroy Mus., pl. lix, fig. B. Moluccas to Malaysia, Carolines, New Guinea, and the South Sea Islands (Tahiti, Samoa, Kingsmill, etc.).

7. *vanicolensis* Cuvier & Valenciennes, *ibid.*, p. 305: Vanicolo = *nesogallica* idd. Fig.—Bleeker, *ibid.*, fig. 6. Moluccas to Vanicolo, Samoa, and Mauritius.

* All the species mentioned in this list are liable to occur on some part of the Australian or Tasmanian Coasts.

† Both these species are included in the list of West Australian Fishes published by Mr. Malcolm Fraser in 1903, but further information is requisite before these records can be accepted.

‡ The species printed in italics have not as yet been recorded from Australian Seas.

8. *analis* Waite, Trans. N. Z. Inst., xlii, 1910, p. 375: Kermadec Islands.
- iii. PARAPRIACANTHUS Steindachner, Sitz. Akad. Wien, xli, 1870, p. 623 (*ransonneti*) = *Pempherichthys* Klunzinger 1871.
9. *unwini* Ogilby, Mem. Austr. Mus., ii, 1889, p. 60, pl. iii, fig. 1: Lord Howe Island.
10. ELONGATUS McCulloch, *ibid.*, p. 47, pl. iv, fig. 1: Flinders' Island, Bass Strait, to Wilson's Promontory, Vic.
- iv. LEPTOBRAMA Steindachner, *ibid.*, lxxviii, i, 1878, p. 388 (*mulleri*) = *Neopempheris* Macleay 1881.
11. MÜLLERI Steindachner, *ibid.*, pl. iii, fig. 1: = *ramsayi* Macleay 1881 := *pectoralis* Ramsay and Ogilby 1887. Coasts of Australia.

NOTE.—In my article on *Polynemus specularis* de Vis* I wrote re *Polynemus multiradiatus* Günther—"I do not know what Klunzinger's fish of the same name may be." I am quite satisfied now that this sentence was penned through my mentally confusing Günther's species with *Pempheris multiradiata* Klunzinger.

PART II.—THE GADOPSEIFORM PERCOIDS.

(Plate XX.)

In Mr. Tate Regan's masterly paper on the "Classification of the Percoid Fishes,"† he diagnoses the gadopseiform percoids as follows:—

DIVISION GADOPSEIFORMES.

"*Gadopsis* scarcely differs from the Perciformes in osteology, but there is no mesopterygoid and there are 2 radials on the hypercoracoid and 2 on the hypocoracoid. The pelvic fins are jugular, each reduced to a small spine and a bifid ray. Against Blennioid relationships are the intervention of the prootic between the parasphenoid and the alisphenoid, the 3 anal spines, the dorsal and anal rays more numerous than the corresponding myotomes. Vertebrae 21 + 26; ribs, except the first 2 or 3, on strong parapophyses."

The position here allotted to *Gadopsis* is much more satisfactory than that assigned to it by previous authors.

FAMILY GADOPSEIDÆ.

Blenniidæ part. Richardson, Zool. Erebus & Terror, ii, 1848, Ichth., p. 122.

Gadopsidæ Günther, Brit. Mus. Catal. Fish., iv, 1862, p. 318.

Body elongate-elliptical to elongate, more or less compressed, covered with minute, adherent, concentrically striated, cycloid scales. Lateral line continuous,

* Ann. Queensl. Mus., No. 10, 1911, p. 45.

† Ann. & Mag. Nat. Hist. (8) xii, 1913, p. 135.

not extending on the caudal fin, the tubes long and simple. Head almost wholly sealy, with rather long, obtusely pointed snout, the mucous system well developed. Mouth terminal, with moderate oblique cleft, the upper jaw projecting; premaxillaries forming the entire dentigerous border of the upper jaw, the maxillaries exposed and dilated distally. Jaws with a pluriserial band of small cardiform teeth, the outer series much enlarged, widely set, and conical; a patch of small teeth on the head of the vomer, and a band of even smaller ones on the palatines; pterygoids and tongue smooth. Two moderate, widely separated nostrils on each side, the anterior tubular. Eyes small, anteromedian, lateral. Opercle with a small, flat spine. Vertical fins naked, with the posterior rays increasingly crowded. One long dorsal fin, with viii to xiii 28 to 25 rays, the spinous portion much shorter than the soft, the spines short and weak, graduated. Caudal free and rounded. Anal similar to the dorsal, with iii 17 to 19 rays. Pectoral small, symmetrical, with 16 or 17 rays, the middle longest, inserted below the middle of the body. Ventral jugular, composed of a small spine and a single bifid ray. Gill-openings wide; gill-membranes separate, free from the isthmus; branchiostegals six; pseudobranchiae present, glandular; gills four, a narrow slit behind the fourth; gill-rakers in small number, short, stout, and spinulose; pharyngeal bones separate, armed with well developed cardiform teeth; air-bladder present, simple. Stomach caecal; pyloric appendages in moderate number; intestinal canal straight. Premaxillary processes short; supraoccipital crest vestigial; coracoid dilated; scapula without foramen; pectoral arch attached to the skull by a simple posttemporal.

An aberrant monotypic family of pereoid fishes, holding an isolated position, and inhabiting the fresh waters of Northern Tasmania and South-Eastern Australia; it has not as yet been recorded west of the Torrens River, South Australia, but is included by Zietz* among the edible fishes of the Lower Murray, up which and its tributaries it ascends, even to its remote head waters in the Queensland Ranges, where it is now firmly established; here its general appearance and slippery nature have given rise to the persistent belief in the presence of an eel in our transmontane waters.

GADOPSIS Richardson.

Gadopsis Richardson, Zool. Erebus & Terror, ii, 1848, Ichth., p. 122; no description (*marmorata*); Günther, Brit. Mus. Catal. Fish., iv, 1862, p. 318; McCoy, Prodr. Zool. Vic., dec. iii, 1879, p. 39; Ogilby, Edib. Fish. & Crust. N. S. Wales, 1893, p. 149

Characters of the family. (*Gadus*, eod; ᾠψις, gen. ᾠψεως, resemblance: from a superficial likeness to that fish.)

The genus *Gadopsis* has had a somewhat varied experience as to its position in the system. Its original author considered it "to belong to the Blennioid family." From thence it was removed by Günther, who placed it at the head of

* Trans. Roy. Soc. South Australia, xxvi, 1902, p. 267.

his "ANACANTHINI GADOIDEI," defining its position in the following words—"Before entering into an account of the true Gadoid fishes, we must intercalate the type of a separate family, which, although having every character of a Gadoid, has true spines in the dorsal and anal fins, thus forming a connecting link between the Acanthopterygians and the Malacopterygians. The structure of the dorsal fin, the presence of pyloric appendages, etc., prevent its being placed among the Blennoids." Four years later Steindachner* reasserted its affinity with the blennies, and was subsequently supported by Gill, who† placed the family *Gadopsidæ* between the *Cepolidæ* and *Clinidæ*. Günther, however, adhered to his original opinion, since we find him in 1880‡ retaining *Gadopsis* among the ANACANTHINI. Coming to more recent times Boulenger§ and Goodrich|| both refer it to the *Blenniidæ*, not even allowing it family rank. The latest announcement on the subject by Regan I have already reproduced.

GADOPSIS MARMORATA Richardson.

Gadopsis marmoratus Richardson, Zool. Erebus & Terror, ii, 1848, Ichth., p. 122, pl. lix, figs. 6 to 11: Rivers in the southern parts of Australia ¶—Günther, Brit. Mus. Catal. Fish., iv, 1862, p. 318—Steindachner, Sitzb. Akad. Wien, liii, i, 1866, p. 457—Klunzinger, Arch. f. Nat., 1872, i, p. 38—Castelnau, Proc. Zool. & Accl. Soc. Vic., i, 1872, p. 160—id., Essay Edib. Fish. Vic., 1873, p. 14—Klunzinger, Sitzb. Akad. Wien, lxxx, i, 1879, p. 393—Rep. Roy. Comm. Fisher. N. S. Wales, 1880, p. 89—Macleay, Proc. Linn. Soc. N. S. Wales, vi, 1881, p. 112—Johnston, Proc. Roy. Soc. Tas., 1881 (1882), pp. 60 & 124—Woods, Fish & Fisher. N. S. Wales, 1882, p. 105—Ogilby, Catal. Fish. N. S. Wales, 1886, p. 37—Lucas, Proc. Roy. Soc. Vic. (n.s.) ii, 1890, p. 33—Johnston, *ibid.*, 1890 (1891), pp. 26 & 35—Ogilby, Edib. Fish. & Crust. N. S. Wales, 1893, p. 149—Kent, Naturalist in Anstr., 1897, p. 156—Zietz, Trans. Roy. Soc. S. Austr., xxvi, 1902, p. 267—Waite, Synops. Fish. N. S. Wales, 1904, p. 53—Stead, Fish. Austr., 1906, p. 210, text-fig. 74—id., Edib. Fish. N. S. Wales, 1908, p. 116, pl. lxxx—McCulloch, Proc. Linn. Soc. N. S. Wales, xxxvi, 1911, p. 82.

Gadopsis gracilis McCoy, Prodr. Zool. Vic., dec. iii, 1879, p. 39, pl. xxvii, fig. 2: Yarra River, Vic.

Gadopsis gibbosus McCoy, *ibid.*, p. 41.

Gadopsis fuscus Steindachner, Sitzb. Akad. Wien, lxxxviii, i, 1884, p. 1105, pl. i, fig. 2: Fresh-waters of South Australia.

Gadopsis sp. Macleay, Proc. Linn. Soc. N. S. Wales, x, 1885, p. 267: Little River at Yass, N. S. W.

* Sitzb. Akad. Wien, liii, 1866, p. 456.

† "Families and Subfamilies of Fishes," Mem. Nat. Acad. Sci. Washington, vi, p. 136.

‡ Study of Fishes, p. 537.

§ Cambridge Nat. Hist., Fish., 1904, p. 709.

|| In Lankester's Treatise on Zoology, pt. ix, 1909, p. 458.

¶ Castelnau (*ibid.* 1) states that Richardson's type "was brought from Tasmania," and the statement has doubtless influenced subsequent authors in their treatment of the species. There is, however, no justification whatever for this assertion, since Richardson distinctly gives the locality as above. Günther, in his list of the specimens in the British Museum (1862), refers to what is possibly the type in the following terms:—

a. Skin, in spirits. Australia. From Mr. Gould's collection.

THE SLIPPERY.

BLACKFISH; FRESH-WATER BLACKFISH; RIVER BLACKFISH; TAILOR OR TAILER
(at Guntawang, N.S.W.); MARBLED RIVER COD.

(Plate XX.)

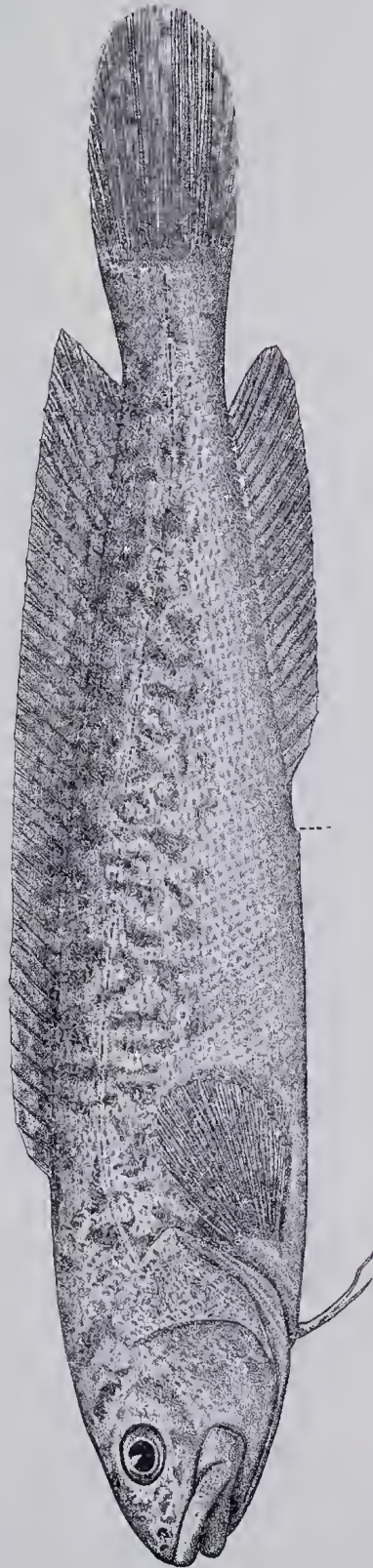
Depth of body 4.5 to 5.4, length of head 3.6 to 4.1, of caudal fin 4.8 to 5.9, of pectoral 5.85 to 7.55, of ventral 6.25 to 7.8 in length of body. Length of snout 3.1 to 3.6, diameter of eye 4.8 to 6.55, width of interorbit 3.9 to 5, length of maxillary 2.15 to 2.6, of mandible 1.75 to 2.15, height of soft dorsal 1.75 to 2.35, of anal 2 to 2.65 in length of head.

Body tapering gracefully from the shoulders backward, its width 1.4 to 1.6 in its depth, which is 1.15 to 1.45 in the length of the head: caudal peduncle slender, its least depth, which is immediately behind the dorsal fin, 1.35 to 1.6 in its length and 2.45 to 2.9 in the depth of the body. Head deeper than wide, its upper profile more or less gibbous behind the frontal region, its width at the cheeks, which are somewhat swollen, 1.7 to 2 in its length, which is 1 to 1.3 in that of the trunk. Anterior profile of snout strongly convex, the upper linear or feebly convex and continuous with the frontal region. Diameter of eye 1.5 to 1.9 in the length of the snout, 1.1 to 1.4 in that of the convex interorbital width, and 2.6 to 3.3 in the postorbital length of the head. Maxillary extending to below or a little behind the pupil, the width of its distal expansion 1.4 to 1.8 in the eye-diameter.

Lateral line following the contour of the back, and consisting of from 45 to 50 tubes, each of which corresponds to from 2 to 3 series of body-scales. Mucous system of head reaching the surface by means of large open pores, of which there are two principal series; an inner from the snout along the edges of the preorbital and suborbital bones, finally curving upwards behind the eye; and an outer along the mandibles and the border of the preopercle; in addition to these there are a conspicuous pair arranged transversely between each pair of nostrils, and a third pair arranged longitudinally along the middle of the interorbital region.

D. viii to x 28 to 26; A. iii 17 to 19; P. 17. Dorsal fin originating above the middle of the appressed pectoral, the last spine longest, 1.1 to 1.45 in the length of the snout and 1.6 to 2.35 in the longest ray, which is near the end of the fin and does not reach to the caudal when depressed.* Anal originating below the fifth or sixth dorsal ray, and not extending so far back as that fin; spines graduated like those of the dorsal, but much stronger and pungent, the last as long as or a little longer than that of the dorsal and 1.5 to 2 in

* In Richardson's figure the rays are depicted as reaching well beyond the base of the caudal.



GADOPSIS MARMORATUS Richardson. Nat. Size

D. B. Fry, del.

NATIONAL MUSEUM MELBOURNE

the longest ray. Length of pectoral 1.55 to 1.9 in that of the head. Inner branch of ventral ray the longer, 2.3 to 3.1 in the space between its origin and the vent.

Gill-rakers 2 or 3 + 5, the longest 2.5 to 2.7 in the eye-diameter. Vent postmedian, its distance from the root of the caudal 1.15 to 1.4 in that to the tip of the snout.

Pale olive-green, the back and sides more or less conspicuously marbled with dark olive- or chocolate-brown, the marking often taking the form of more or less regular vertical bars between the dorsal fin and the lateral line; abdominal region light yellowish green finely powdered with darker. Upper surface of head beyond the occiput dull blue, the cheeks similarly but more lightly tinted. Basal half of vertical fins greenish yellow, shading to a dull blue-gray on the outer moiety; dorsal fin with a basal series of brown blotches, which are much more pronounced on the soft rays, where also there is sometimes an inconspicuous series of median blotches: caudal uniform in the adult, but with a broad terminal and median darker transverse band in the young, the pectorals and ventrals immaculate, the latter yellowish (*marmoratus*, marbled).

Described from 10 examples, measuring from 110 to 235 millim., in the State Museum; four of these belong to the old collection and are in fair condition; they were, I believe, obtained in the Condamine at Killarney by Mr. J. Lamb. The remaining 6 are in perfect condition, and were forwarded lately from the same locality by Mr. J. H. Stevens, Chief Inspector of Fisheries.

Vernacular Names:—Considering its present wide distribution the species is not over-burdened with local names. In the Southern States (Tasmania and the coastal belt of Victoria) it is commonly known as the "Blackfish," a name which is inadmissible as it more properly belongs to the kyphosid genus *Girella*. To obviate this Stead proposed the addition of the word "River," and describes and figures it as the "River Blackfish." This, though an improvement, is too pronounced a misnomer to ever become popular. Similarly the title, proposed by me in 1893, of "Marbled Cod" must be discarded, since the fish has nothing to do with the gadoid anacanthines. Speaking of New South Wales Stead (*in lit.*) says:—"This species is known under a variety of names in different portions of its New South Wales habitat. Rarely is it called 'River Blackfish.' The name of 'Slippery' is applied to it commonly in the vicinity of Orange and thereabouts, and occasionally in other parts, including the Upper Snowy River. That of 'Tailer' is very widely used, more than any other name, for the species, though why, I never could ascertain. In the Macquarie and its feeders—especially the Cudgegong—where I have found *Gadopsis marmoratus* to be especially abundant, the name of 'Tailer' is very firmly established. I have found the name of 'Gudgeon' applied to the fish in some places; and on some of the Upper Murrumbidgee feeders it has been described as a 'Cod.'" In Queensland, according to

Messrs. Stevens and Colelough it goes by the name of "Nikkie Long Cod," usually abbreviated to "Nikkie," in the Warwick District. I have been unable to ascertain any aboriginal name for the fish. From these I have selected "Slippery" as the most suitable and certainly the most expressive title, for the fish is very difficult to handle, being covered with a thick slime, which, according to Mr. Stevens, is very difficult to remove from the hands, and has a peculiar and disagreeable odor.

Variation:—With regard to the comparative length of the head and body, on which McCoy—overlooking the fact that Richardson's description was drawn up from a dried skin and is, for that reason, liable to inaccuracy—lays so much stress, a comparison of my specimens with the tables given by McCoy and Johnston (1) shows that both the Victorian and Tasmanian examples, referred to therein, overlap those of Queensland at each end, as may be seen by the following:—

Locality.	Specimens examined.	Length in millim.	Variation.	Authority.
Yarra, Vic.	3	125 to 635	4.2 to 4.9	McCoy
North Esk, Tas.	7	133 to 273	4.0 to 4.9	Johnston
Condamine, Q.	10	110 to 235	4.4 to 4.8	Ogilby

If there be anyone who still holds the opinion that more than one species of *Gadopsis* exists, the above table should, I think, convince him to the contrary. The other character, on which McCoy places some reliance, namely, the number of dorsal spines, is, when examined, found to be equally fallible. Richardson computed them at 10, Günther at 10 or 11, Castelnau at 12, McCoy at 10 to 12 (*gibbosus* and *gracilis*), Steindachner at 10 (*fuscus*), Ogilby (2) at 10 to 13. Queensland specimens, therefore, show the minimum variation as yet ascertained, *i.e.*, 8 (2) 9 (1) 10 (7). The western form of *Gadopsis* has apparently a more slender body and fewer dorsal spines than its south-eastern prototype, but there is no difference between it and specimens obtained in the lower reaches of the Murray. Nor must we forget that the fishes, which have been recorded from the Murrumbidgee (Macleay), Bell (Ogilby), Macquarie and Namoi (McCulloch), Tumut, Gwydir, and other watersheds (Stead), and now from the Condamine, are primarily descended from the Snowy River stock by way of the Upper Murrumbidgee. These colonists have ever instinctively chosen those affluents which have their source in the higher table-lands, and which, owing to the different conditions of life, of food, and of environment, have increasingly altered in external appearance the further they have drawn away from their parent base. After taking into consideration all the varying conditions under which they live, and analyzing all the available literature on the subject, I cannot see any reason to alter my opinion, expressed twenty years ago, that—"This

species is so variable, not only in its coloration, but also in its comparative measurements and the number of spines and rays in the dorsal fin, that we consider the differences between the typical form and the two species described by McCoy, great as they may appear individually, to be only such as might be expected to occur in a fresh-water species of wide range, and which exists under such varying conditions of life and diversities of climate." These differences are accentuated by the discovery of the Queensland form, but the main issue is in no ways affected thereby. Years ago Johnston came to the same conclusions as are here set out from a "close study of the variability of the Tasmanian *G. marmoratus*." He concludes his remarks with the following pertinent sentence, with which I cordially agree—"It is very hazardous in this genus to create a new species based upon the examination of only two or three individuals." So far as fresh-water fishes at least are concerned he might well have omitted "in this genus." In reference to this subject Mr. David G. Stead, Superintendent of Fishery Investigation, New South Wales, kindly forwards the following note:—"I find a very great amount of variation in both form and color in this species. As in a number of our other fluviatile fishes, the form is generally more elongate in those examples taken from the more rapid streams, than in those from sluggish ones; and particularly is the difference to be noted between the *Gadopsis* of a still lagoon and that of a neighboring stream—the former being comparatively stout and short. The difference is so marked at times, that the specialist might well be pardoned for considering such fishes as specifically distinct, if they were just placed upon his table without any information as to the places whence they came. In color the variation usually ranges from a light brown to a dark greenish brown—with the usual marblings. (The latter may be of a large, or yet quite a small, pattern.) Where the fish is taken from very dark muddy bottoms or very turbid streams it is usually of a dirty blackish color with but little trace of the marmorations."

Historical:—Described originally by Richardson from an undetermined river in Southern Australia, Günther next enlarged its range by the inclusion of Tasmania, while Steindachner, four years later, by obtaining examples from the Murray River, definitely established an Australian locality for the species. The first writer in Australia to publish an account of this fish was Castelnau, who in 1872 recorded it as being "found in almost all the streams of South-Eastern Australia." Under the names *gibbosus* and *gracilis* McCoy, some years later, strove to detach from the parent species two Victorian forms, the latter a slender and generally handsome fish from the Yarra, the former stouter, shorter, and duller in color from the Bunyip River, Gippsland. Recent writers, however, consider that the characters on which these species are based are of too trivial a nature to admit of their specific separation. Macleay (1881) adds nothing to our knowledge of the species, but Johnston in the succeeding year makes some interesting remarks on the subject of its distribution in Tasmania, which are

worth quoting here. He writes:—"It is most singular that this species,* with the Blackfish (*Gadopsis marmoratus*) should be identical with species found abundantly in Victorian Rivers, and wholly absent in all the southern waters of Tasmania. The Unio (*U. moretonicus*), and the Freshwater Lobster (*Astacopsis Franklinii*), are also restricted to the rivers which discharge their waters into Bass's Straits. The peculiar inhabitants of northern rivers, therefore, are more Victorian than South Tasmanian in character, which is remarkable when we consider the present insular character of Tasmania."† And again—"The Blackfish, whose singular distribution has been commented upon, is found in nearly all the rivers of Tasmania which flow into Bass's Straits. Their original absence in some northern streams, such as the South Esk, is somewhat puzzling, but the total absence from all the other rivers and streams of Tasmania where the conditions are identical can only be explained on the principles of geographical distribution as illustrated by Darwin and Wallace." In 1893 the author took exception to the last sentence in the following words, with which he sees no reason now to differ:—"With the latter part of this quotation we can not agree, and we think the solution of the 'puzzle' will be found in the different character of the geological formations through which the streams flow, or the different composition of the water constituting such streams." As somewhat confirming this view Johnston's remark, that in the North Esk they fail to attain to the size found commonly in the other streams of Northern Tasmania, tells against him, for it seems probable that the conditions of life in that stream had a deleterious effect on the fish, which in its southern namesake had become so accentuated as to preclude its very existence in a natural state. Tenison Woods is, I believe, the earliest writer to extend its range to the western waters of New South Wales, alluding to it as "a very common fish in some of our rivers both of eastern and western waters"; but this is merely a general assertion, no locality being mentioned, and must, therefore, be taken for what it is worth.‡ Macleay, however, in 1885 definitely fixed a western habitat by placing on record his acquisition of a specimen from the Little River, a tributary of the Murrumbidgee near Yass. In the previous year Steindachner made another attempt to differentiate from *G. marmoratus* the dull-colored form, peculiar to lagoons and bayous,

* *i.e.* the Bass (*Percalates colonorum*).

† This restricted Tasmanian distribution was first noticed by Mr. Morton Allport, who, in May, 1867, read a paper before the Royal Society of Tasmania "On the Local Distribution of some Tasmanian Animals" (Proc. Roy. Soc. Tas., 1867, pp. 9 to 13), in which the following paragraph occurs (p. 10)—"The large fresh-water fish known to northern colonists as the 'Black-Fish,' and the great river Crayfish, abound in streams flowing to the northern and western coasts, and are wanting in those flowing to the eastern and southern."

‡ Since writing this paragraph I find that Woods' announcement was forestalled by the Report of the Royal Commission on the Fisheries of New South Wales, 1880, in which the following passage occurs:—"The 'black-fish' (*Gadopsis marmoratus*) is a remarkable-looking fish, which is found in all these rivers [*i.e.*, those of the Murray River system]; it is a mud-fish, and is seldom caught except by the emptying or drying-up of a waterhole. It is said to be good, and to attain a length of 16½ inches." My comment, appended above to Woods' record, is equally applicable in this case.